TECH TRENDS IN PLM UPDATE

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MAY 2009

WEBINAR
Simulation-Driven Design with CAE Data Management
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Requirements-Driven Product Development

Case Studies in A&D, Medical Electronics, and Automotive

Don Brown, Chairman; Michel Vrinat, PLM Research Director; CPDA

Over the last decade, requirements management has emerged as a primary driver for quality improvement across product development, by closely coordinating efforts across all disciplines. The three leading firms in this review, from the aerospace, health care, and automotive industries, face a diverse set of challenges in their product development processes. At EADS Astrium, both quality and cost would be at risk without DOORS. The complex tracking of all changes to requirements, partly driven by regulatory needs, fully justified DOORS at Cardinal Health. The pairing of hardware and software, as well as the frequency of changes in software development, drove requirements management at Chrysler. Despite their dramatic differences, requirements management has proven to be a critical initiative that will witness far broader participation across all disciplines in the full product development *(Continues on p. 2)*

CAD / Visualization Trends

Ken Versprille, PLM Research Director, CPDA

The technologies of computer-aided design (CAD) and collaborative visualization hold the promise of transforming product development – slashing time to market, raising quality, and optimizing solutions to best fit customer and market requirements. However, given the large amount of new technology being offered in the marketplace by solution vendors over the past six years, many product development groups have struggled with fully adopting the new approaches. New technology is difficult to learn and deploy within organizations that are often resistant to change. The leaders in many of these companies are now asking, "Where are we relative to the rest of the industry in *(Continues on p.6)*

Integrating Simulation and Test to Achieve the Full Promise of PLM

Challenges and Payoffs as Reflected by a Scorecard of Twenty-Five Leading Edge Users

Michel Vrinat, PLM Research Director, CPDA

The full development of simulation technology will transform product development – slashing time to market, raising quality, and optimizing solutions to best fit customer and market requirements. To track the progress in achieving these objectives, CPDA has completed an industry scorecard assessing the relative positions of leading edge users and the maturity of their design simulation practices. With participation of twenty-five leading edge users in the industry, the scorecard ranks companies in each of three areas – cross-functional capabilities, computer-aided engineering (CAE), and computer-aided test (CAT). *(Continues on p. 8)*

PLM ROAD MAP™ 2009 – FEATURED KEYNOTES

The Paradigm Shift for Vehicle EE Design with Model-Driven Development

Dr. Walden C. Rhines
Chairman and CEO, Mentor Graphics

Transformation of an Engineering Process – Road to Lab to Math (RLM) at GM Powertrain

John L. Givens, Jr.
Director of Engineering Math & Release Processes, GM Powertrain

Outlook for the North American Automotive Industry

Glenn Mercer
Automotive Consultant, Senior Director, IMVP

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cycle. The approach defines a framework for collaboration and integration serving remarkably diverse areas of expertise.

Overall, these organizations appear to be highly dependent on the tool. As Susan Hacker of Cardinal Health states, "We could not manage the full development process without DOORS."

MANAGING REQUIREMENTS WITH DOORS ACROSS THE FULL RANGE OF PRODUCT DEVELOPMENT AT EADS ASTRIUM

As part of its PLM harmonization program called PHENIX, EADS has defined a mandatory policy for requirements management to be applied across all divisions. EADS standardized on DOORS as their requirements-management tool, and entered into a world-wide contractual agreement with IBM Rational – originally Telelogic – to acquire, distribute, and support the product.

EADS Astrium is the number one firm in Europe, and the number three worldwide, in space transportation, satellite systems, and services, including Ariane, the International Space Station, Envisat, and Mars Express. Astrium employs 12,000 people in five countries: France, Germany, the UK, Spain, and the Netherlands.

A long-time user of DOORS, Sharon Crossby runs the requirements management effort in that division. As the software tool of reference at Astrium, DOORS provides great help in assessing requirements, in looking for similarities, and in keeping track of all changes and relationships. But the software is not enough on its own. A process with a methodical review of requirements is necessary, based on strong standard practices, as well as training and competency development for the engineers. The tool supports the process well, and without the tool the process would not work. However, the process must be well defined as the foundation.

A key aspect of requirements management is how cross-functional teams resolve conflicting and proliferating changes across disciplines such as the electrical and mechanical areas and across the supply chain with multiple suppliers. There is a strong need for a common approval process to coordinate multiple changes done by each team, both on the requirements and on the verification methods. Within the DOORS environment, a requirement cannot be modified without documenting the details of what was changed, when, and by whom; it then saves the history of the requirement content. With a required change, an analysis of the impact must be performed to identify all linked items, including the lower levels of requirements decomposition, and across verification methods, before the change process can be launched. The management of dependencies across multiple disciplines is vital.

DOORS' biggest win relates to its support of traceability in tracking customer needs through fulfillment and across the full development cycle.

Currently, EADS Astrium is investigating the potential integration with tools such as IBM Rational ClearQuest and ClearCase for change management, while the EADS PHENIX program already supports a standard process for change and configuration management implemented with a common repository for a master product definition.

According to Sharon, without DOORS, quality and cost would be at risk. DOORS provides essential support for a good process. But, if it's a bad process, DOORS will not make it any better.

DOORS' biggest win relates to its support of traceability in tracking customer needs through fulfillment and across the full development cycle. That traceability can demonstrate to a customer that the proposed solution meets their needs. In terms of development efforts in the continuing evolution of DOORS, Astrium would most like to have Web access that is more intuitive, and direct workflow integration.

MEETING REGULATORY REQUIREMENTS AND DRIVING REUSE AT CARDINAL HEALTH

Cardinal Health is an $87 billion global distributor and manufacturer of medical and surgical supplies and technologies. Susan

Hacker, Senior Software Technical Editor, works directly in supporting requirements management as the DOORS database administrator for the clinical and medical products group, which represents approximately $1.8 billion in revenues with 14,200 employees worldwide. The products supported cover a broad range of needs including infusion pumps for intravenous medication, automated medication and supply management systems, thermometry and respiratory products, and wireless, barcode-enabled patient identification systems.

The most important application of DOORS relates to infusion pumps. Because all changes to requirements must be tracked and validated to meet regulatory needs, DOORS was readily justified. Every update involving a feature upgrade, a change in response to a problem, or simply a bug fix, requires a documented analysis. Before DOORS, all this analysis was done manually. Moreover, with modular systems, a new module with new features complementing the original involves an evaluation of all the original requirements for applicability and retest, with a complex tracing back to user needs and certifications. With a new module for the infusion pump, developers review every requirement to see if it applies for the new module. Four or five hundred changes could be involved to produce a new module, impacting a whole list of pre-existing modules. If a requirement applies to the new module, then a change proposal must be processed.

DOORS addresses the growing complexity of managing feature upgrades with dramatic and major assistance in the reuse of requirements. User-defined needs migrate from one release to the next, and new ones may be added. Typically, the addition of a new module might involve two hundred and fifty requirements, whereas a new feature may need considerably fewer. Ninety to ninety-five percent of the existing requirements will migrate over, two to five percent may be new, and some of the existing requirements may be obsoleted. With DOORS, the upgrade inherits the established structure, and links with user needs, requirements, and test. The links are maintained across all projects and versions. The test management system manages the test cases, and interfaces directly with DOORS.

Without DOORS, major problems would arise. For example, one major product has evolved over fifteen years, with roughly two thousand requirements tracing to volumes of documentation. Every requirement has a test case. Starting over from scratch would involve the work of writing all new test cases, followed by an FDA audit for approval. “We could not develop the infusion pump without DOORS,” states Susan. “Even two or three hundred requirements would involve a huge job of manually tracking user needs to hazards, through requirements, specifications, and test. The linking in DOORS makes it much easier to do. Eighty to eighty-five percent of the traceable items are linked, and we can handle the rest manually.”

FULLY COORDINATING PEOPLE, PROCESS, AND TOOLS WITH REQUIREMENTS MANAGEMENT AT CHRYSLER

At Chrysler, Powertrain Product Engineering (PTPE) together with Electrical Engineering Core (E/E Core) spearheaded requirements management using DOORS across the engineering process. The electrical engineering group fully understood the thinking of the designer and engineer who would be using the solution, and who would benefit from an effective approach addressing the escalating complexity of mechatronics designs. Addressing cultural issues proved to be a higher priority than the technical solution itself. By comparison, years earlier the vice president in charge of components and processes had tried to drive the first and early efforts targeting requirements management. That early program stalled because the managers did not directly and effectively target the actual designers producing the parts. In a sense, management’s top-down thinking simply did not connect with the part-centric culture of the designers and engineers in the automotive sector.

Chrysler relies on the combination of IBM Rational DOORS, Synergy, and Change, to manage the full range of requirements from fully automated software testing to physical vehicle validation. In addition, HP Quality Center manages all tests directly, from component to system to full vehicle, and provides maturity reports, while integrating with both DOORS and Synergy.

Overall, people and process must be fully coordinated from the conceptual definition, through design, development, testing, deployment, and support, using the requirements management tools. Indeed, the people and process issues represent even higher priorities than the technical capabilities of the tools. Team members and stakeholders must be continuously connected to establish and maintain traceability across the full development cycle.

All three of our leading users commented on each of the three critical aspects for managing requirements – their early development, change traceability, and reuse.

Edward Griffor, a Technical Fellow at Chrysler, clearly recognizes and respects the vision of reconciling the efforts of the many disciplines involved in product development through requirements management technology. That vision, however, must be tempered by the reality that no system today directly addresses the conflicting language and terminology of the physics and logic domains. The success of the release process itself depends upon a review by those involved in the design directly contributing their expertise. Indeed, formal design reviews target the objective of having the people and experts involved recognize and address any outstanding problems. While repetitive tasks justify the effort to codify a solution for automation, that codification itself requires human interaction to define a process and the pre-requisites for automation. In effect, continuous improvement can be achieved by automating various rules in the evolution of the design process, but that evolution will regularly result in incremental improvements rather than a grand-slam, total solution. Indeed, the release process may never be fully automated, and must address the combined needs of people, process, and tools.

THE PAYOFF: GATHERING, DEVELOPING, AND SHARING REQUIREMENTS ACROSS MULTIPLE DISCIPLINES

All three of our leading users commented on each of the three critical aspects for managing requirements – their early development, change traceability, and reuse. Considering the first aspect, DOORS supports documents in the form of a set of objects that can be viewed through different filters, and provides varying security levels. The capability supports one central repository of all requirements, which helps maintain consistency across the multiple disciplines and phases of product development. Multiple views of the data serve different groups of people in an organization, as well as different use cases for the data, and can extend outward to be shared with suppliers.

... Another payoff from DOORS consistently referenced by leading users relates to the ability to freeze requirements and create a baseline for a release.

Another payoff from DOORS consistently referenced by leading users relates to the ability to freeze requirements and create a baseline for a release. Organizations then rely on the baseline to manage requirements for various system releases, and teams may work in parallel on multiple releases at the same time.

Upfront system modeling and more detailed discussions with customers represent activities that may help identify ambiguous or contradictory requirements early in the design cycle. DOORS' support of structured and prioritized requirements fulfills these much needed capabilities. DOORS also provides a description of the functional structure and links between functions and requirements that map the two.

Traceability represents another fundamental need for requirements management. Originally it involved the tracing of requirements at various specification levels, such as system specifications that must be clearly linked to each subsystem specification, and vice versa.

Organizations like Chrysler and EADS dramatically extend the approach to clearly understand when, why, and by whom a change has been implemented. The structure for requirements, with links between system-level requirements, sub-systems, and component requirements, provides the ability to analyze the impact of changes at the different levels and across disciplines. The top-down view helps with coordination and planning, monitoring of progress, and confirmation of compliance to requirements.

Bottom-up traceability enables designers and analysts to track all areas impacted by a change to verify that the expected impact does address the targeted requirements, defects, and/or requests for change. The development effort must trace back to the original requirements. Otherwise, developers may work on the wrong version of the specification or not fully understand the context and business value. Roundtrip traceability supporting both top-down and bottom-up tracking helps prevent unnecessary unfocused development and costly rework.

The volume of requirements that must be addressed continues to increase significantly. As Sharon Crossby of EADS Astrium concludes, "With too many requirements, and internal business processes and constraints, the volume itself and the associated issues of potential contradictions become a much bigger challenge than any missing requirements." As a result, the reuse of established requirements becomes paramount, involving the ability to focus on the differences between the requirements for the existing and established designs, with those for the new version, to meet emerging needs.

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Download the full paper, ***Requirements-Driven Product Development: Case Studies in A&D, Medical Electronics, and Automotive,*** here: https://cpd-associates.com?download=RequirementsDrivenPD

GLENN MERCER

Automotive Consultant; Senior Director, IMVP

Outlook for the North American Automotive Industry

Roughly a century after it began the automotive industry in America faces one of the most turbulent times in its history. Simultaneously it must deal with a transformation of its products to meet strikingly higher fuel economy targets, an economic downturn that leaves no domestic OEM unthreatened by insolvency, and the strongest set of competitors it has ever seen. Further, the nature of the crisis challenges every part of the industry, from dealers to finance firms to suppliers to labor to car makers, and more. Finally, the rate of change from month-to-month is so rapid that few forecasts stay intact for long.

To try to make some sense out of the turmoil, and to provide a few guideposts for future plans, Glenn Mercer's keynote address will draw upon a quarter century of consulting work and academic research into the automotive industry. In his presentation, he will focus on the thesis that only by understanding the historical roots of our current challenges, can we build a future for the industry that does not fall back into the past boom and bust cycle.

ABOUT GLENN MERCER

As an independent consultant, board member, and lecturer Glenn Mercer serves a broad range of companies and investors in the automotive sector. Before establishing his own firm, he worked with McKinsey & Company for two decades, culminating his career as a Partner in McKinsey's Automotive Practice. In this role Glenn provided clients focused expertise and knowledge in all functional areas for automotive, from product development, through sourcing, purchasing, manufacturing, logistics, distribution, retailing, and marketing. He covered such diverse topics as globalization, labor issues, modularization of cars, platforming, warranty and quality management, technology management, and channel management. He has undertaken work on four continents, for OEMs and suppliers as well as dealer groups, aftermarket firms, insurers, truck fleets, car rental companies, automotive finance arms, and more. Glenn has also authored over a hundred articles, speeches, and presentations for various automotive groups and journals. As Past President of the Society of Automotive Analysts, he has also partnered with external research groups including MIT, GERPISA, the University of Michigan, the Center for Automotive Research, and J.D. Power, on a range of research projects.

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assimilating these new technologies? Are we on par with others or are we lagging?"

The CPDA scorecard for CAD and visualization concentrates on the six most commonly discussed issues that product development organizations bring to the table when seeking advice on their use of technology. It is also important to note that for all six trends, the nature of the design process interweaves with the technology tools used to support that process – process and technology walk hand-in-hand.

TREND #1:
CAD DATA QUALITY

Have corporate standards been established and documented for CAD data? Are processes and tools in place to validate adherence to those standards? The criteria to rate a company's maturity level in CAD Data Quality involve two key aspects: the establishment and documentation of design standards, and the technology tools necessary to validate that models adhere to those standards. By defining and promoting the use of corporate CAD standards, companies are discovering that they can establish and maintain consistency, promote best practices, and leverage CAD models downstream in their development process.

TREND #2:
STRUCTURED MODELING AT THE COMPONENT LEVEL

How can design consistently structure CAD models to more easily enable integration with other disciplines and encourage reuse? The criteria for Structured Modeling maturity look for the definition and reuse of standard sketches and parametric schemas. One will often see the use of standard libraries, or seed parts. The definition and use of user-defined form features is also common. Is there a consistent set of parameters, sketches, and geometric constraints (although parameter values may vary) between like components in each product? The ability to recognize parameter schemas and sketches, and to save and reuse them, supports consistency and promotes best practices, as well as reducing cycle time and cost.

TREND #3:
ASSEMBLY/PRODUCT STRUCTURE

How can design better structure CAD assemblies to facilitate cross-platform and multiple-configuration management? Similar to trend #2 at the component level, the leading edge trend for #3 concerning Assembly/Product Structure is to recognize repeated use of similar structures in CAD for like products, and to save and reuse those structures. This allows for decoupled development. These benefits again promote consistency and cut cycle times. Predefined skeletons of structures are often a key aspect. Another common term used by many companies is assembly templates, just as those for trend #2 are called CAD Part templates.

TREND #4:
PHYSICAL COMPONENT REUSE

What technology, data repositories, and processes are in place and being used to leverage component, design, and knowledge reuse? Physical component reuse is often the most talked-about topic today in CAD design. The benefits of reuse deliver directly to a company's bottom line. For most companies the term Physical Component Reuse is just that – the reuse of tangible components designed and built for previous products, now reused as-is in the current product. In addition all relative data such as CAE analysis results and manufacturing processes can be reused. There is, however, a small contingent of users that also include the reuse of previously created CAD model databases in this category. CPDA prefers to call such a practice Digital Reuse. The criteria for levels of maturity in the scorecard do take into account both definitions of reuse.

TREND #5:
MULTI-DISCIPLINARY INTEGRATION

How can design facilitate better integration with other product development domains and improve in-process change management across domains? For many years, design was king among the product development technical domains. CAE analysts had to accept whatever was delivered by design despite any and all of their requests for changes that could help them to do their jobs better. Manufacturing had to settle for what design deigned to provide, often having to redo or create added data for themselves. Today, a spirit of teaming prevails. How can the design efforts be better integrated to help the other downstream disciplines develop and deliver quality products? The criteria to rate the maturity of a company's Multi-disciplinary Integration focus on the actual data that is created within a CAD model, or the links to external data that are embedded in the CAD model, in support of down-stream applications. For example, if the model is a sheet metal part, design may include mid-surface geometry for CAE analysts to more easily perform their needed tests.

TREND #6: ENGINEERING COLLABORATION

How can design expedite cross-group and cross-discipline interaction to improve quality and cost, and shorten the design cycle? Collaboration has become essential as companies employ concurrent engineering and develop products globally. There is a diverse suite of collaboration technologies offered by the commercial vendors. Companies are asking which is the most appropriate for their use and how that technology may be best deployed.

Engineering Collaboration, in itself, is a broad-ranging technical topic. The criteria for evaluating maturity cross three areas. Infrastructure covers the hardware and software approach used to collaborate on product designs. Collaborative Modeling Techniques include the operations on CAD models within the company's collaboration tools, such as view, mark-up, sectioning, and interference checking. Finally, Collaborative Process Operations include the use of integrated tools for requesting a collaborative session, and integration with any workflow application to record that a collaborative session was held.

STUDY RESULTS

As summarized in the figure to the right on the study's results for the six trends, for all trends the industry averages tend to center above maturity level 2, except for Physical Component Reuse which extends above maturity level 3. Best in class (or maximum maturity levels) follow a similar pattern one level higher. Most of these leaders extended well above maturity level 3, with one scoring into level 4 for Physical Component Reuse.

Because of the limited sample size, we must caution against over analyzing the results. However, it is clear from this representative sample that any individual company that finds itself in a level 1 or lower situation for any of these CAD/visualization trends should closely examine their status. It may well be that given the nature of their product the specific trend does not apply to them. For example, one company interviewed in this study legitimately indicated they are centrally located and do not work with a supply chain, therefore engineering collaboration was not a critical need. If, however, the trend is deemed important and the company has a rating of 1 or less, corrective action is warranted.

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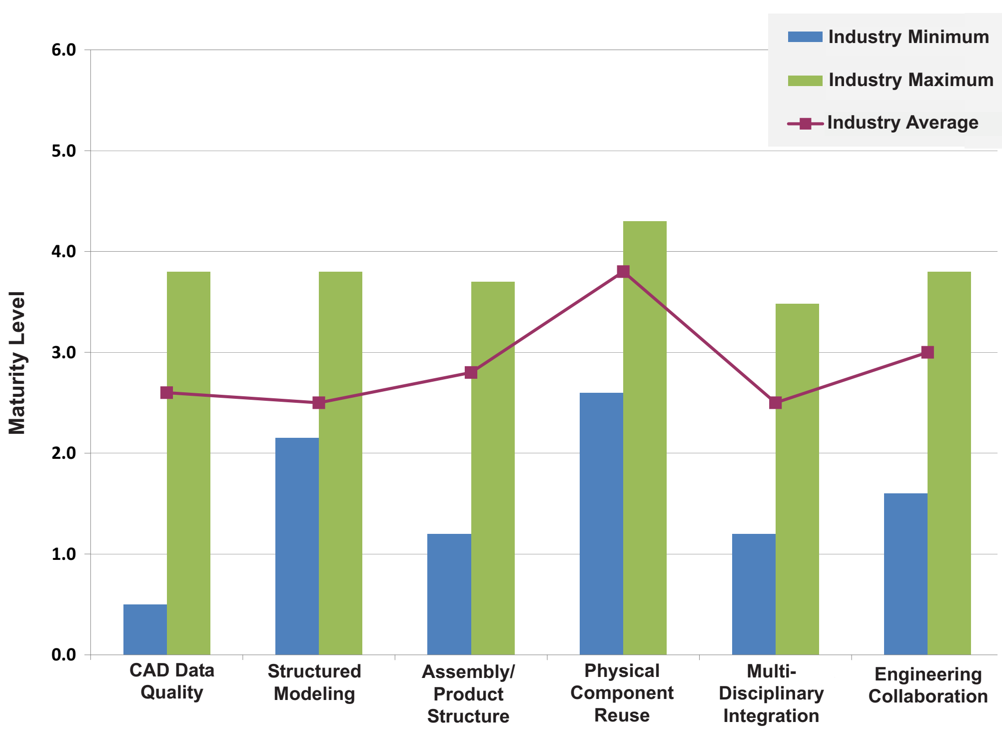
FIGURE 9: *CAD/Visualization Trends – Industry Maturity*



CPDA's Analysts On the Road...

Don Brown and Dr. Ken Versprille hosted industry analyst workshops in April at COFES 2009, the Congress on the Future of Engineering Software in Scottsdale, Arizona.

Don led a discussion on mechatronics, which presents a new generation of development practices across mechanical, electrical control, and software development disciplines. He highlighted the key findings that emerged from an assessment of the current levels of maturity observed among twelve leading manufacturers.

Ken's session explored Trends in CAD Data Quality, which centers on defining and promoting the use of corporate CAD standards in order to establish and maintain consistency, promote compatibility with best process practices, and improve integration with down-stream disciplines in their development process.

Integrating Simulation and Test

(Continued from page 1)

The survey shows an increasing awareness across all industrial sectors of the need to integrate simulation and physical tests in the mainstream of PLM. This is the only way to ensure full consistency across each area of specialty engineering and to boost the ROI of PLM projects. PLM has focused far too long on 3D modeling and mechanical design, creating a specialized silo with computerized walls that are more difficult to remove than the brick walls separating departments. The minimum objective across industry should directly target the integration of design, simulation, and physical tests together with the underlying support of requirements engineering to serve as a common thread.

CROSS-FUNCTIONAL CAPABILITIES
In terms of cross-functional capabilities, the integration of requirements management across the full product development lifecycle, and specifically its link with simulation, represents a critical trend. Additional high priorities reviewed reflect the use of simulation to support robust design; the standardization of the work procedure across design, simulation, and test; the integration and correlation between simulation and physical test; and finally, the planning for development and validation.

With an average rating of 2.58 overall, cross-functional integration is not very well supported with the systematic use of PLM technology. Moreover, a standard process to support integration is lacking.

The best results derived from the effective planning of the use of simulation to validate design at each stage of product development.

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Integrating Simulation and Test

The leaders manage the effort at the enterprise level, with light adaptation at the local level for project-specific needs. Considering the integration and correlation of simulation data with test, supported by operational feedback, only four companies, mainly in the automotive sector, have reached the fourth level of maturity supporting a common portal. Nearly all clearly recognize and prioritize the need for integration and correlation, but the difficulty of assembling data from disparate sources remains an obstacle. Regarding requirements management, only one company, in the automotive industry, shows a reasonable level of maturity in linking requirements to simulation parameters.

COMPUTER-AIDED ENGINEERING

CAE, computer-aided engineering, represents the core of the simulation work. It embraces multiple disciplines ranging from structural stress analysis to electro-magnetic, noise and vibration, acoustics, or crash simulation. The coupling of several of these domains has become more and more necessary to support better optimization of product design, requiring specific processes and data synchronization, or data sharing.

For model building, the integration with design from both a data and a process point of view appears as the highest priority. The capability to transfer more or less automatically the geometry from the CAD model to the simulation pre-processing tool for meshing, or to build a mathematical model in general, represents a key factor to reduce cycle time.

Global harmonization and standard work management represent important aspects of effective simulation deployment, and survey participants have achieved a good level of maturity in the area. An average of slightly over three reflects a common core tool set that is used across the firm globally, supporting additional local applications. The highest level of maturity required involves operations across the whole extended enterprise, including major suppliers sharing the same tool set, methods, processes, and supporting organization.

COMPUTER-AIDED TEST

CAT, or computer-aided test, involves the integration of physical test into the overall product development process. It has made impressive progress as the capabilities of the participants in physical test surpass CAE in several areas. That result stands out dramatically considering that test has been an independent and separate specialty for a long time, isolated from the PLM world and the engineering development process in general.

Data analysis and data acquisition present the highest rated areas for this category, with the largest number of participants reaching maturity level five in the overall survey. In terms of acquiring the data from the test equipment, four companies reached level five with test data directly loaded into a centralized database and shared on the network. Standardization of the test definition and request process is well established as a good practice.

Overall, the survey has shown an extremely high level of interest among the participants in evaluating their own standing in comparison to others, with the feedback directly provided from participating in the survey. The level of maturity across industry is still evolving rapidly, which presents challenges in evaluating the leading edge versus common practices. Nobody can afford to be late, but as the impact of implementing novel approaches on the organization, culture, and technical framework presents serious challenges, many companies prefer to maintain the status quo, waiting for others to pave the way. This needs to change. A proactive role should be taken by the companies developing intensively engineered products as they cannot afford failure or the escalating costs of late changes due to deficiencies in the integration of design, simulation, and test processes.

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DR. WALDEN C. RHINES
Chairman and CEO, Mentor Graphics

The Paradigm Shift for Vehicle EE Design with Model-Driven Development

The growth in electronics and software content in modern vehicles has reached critical mass, and the quality of the electronics, software, and interconnect technologies now dictates the quality of the product. Many vehicles can be considered configurable mobile computing platforms that comprise a complex network of interconnected devices. Escalating electronic complexity calls for a paradigm shift with the adoption of a systems approach to designing, verifying, and integrating electronic and software components in a networked multi-domain environment while focusing on the goal of ensuring high-performance designs and keeping costs and schedules under control.

Incorporating an MDD process into the development life cycle lays the groundwork for an integrated design flow. Such processes directly address systems integration, thereby solving issues faced by automotive and commercial vehicle OEMs and suppliers today. In his keynote address, Dr. Walden Rhines will talk about a new model-driven development (MDD) methodology that supports today’s emerging design requirements.

ABOUT DR. WALDEN C. RHINES

Walden C. Rhines is Chairman and Chief Executive Officer of Mentor Graphics. Prior to joining Mentor Graphics, Rhines was Executive Vice President of Texas Instruments’ (TI) Semiconductor Group, sharing responsibility for TI’s Components Sector, and having direct responsibility for the entire semiconductor business with more than $5 billion of revenue and over 30,000 people. During his 21 years at TI, Rhines managed TI’s drive into digital signal processing that became the cornerstone of TI’s semiconductor technology. He was also responsible for development of the first TI speech synthesis devices (used in “Speak & Spell”) and is co-inventor of the GaN blue-violet light emitting diode. He was also President of TI’s Data Systems Group.

Rhines is currently in his fourth term as Chairman of the Electronic Design Automation Consortium. He is also a board member of the Semiconductor Research Corporation, the Global Semiconductor Alliance, Lewis and Clark College, and the Portland Classic Wines Auction. He has previously served as chairman of the Semiconductor Technical Advisory Committee of the Department of Commerce, as an executive committee member of the board of directors of the Corporation for Open Systems and as a board member of the Computer and Business Equipment Manufacturers' Association (CBEMA), SEMI-Sematech/SISA, Electronic Design Automation Consortium (EDAC), University of Michigan National Advisory Council, and Sematech.

JOHN L. GIVENS, JR.

Director of Engineering Math & Release Processes, GM Powertrain

Transformation of an Engineering Process – Road to Lab to Math (RLM) at GM Powertrain

By relying on math, or CAx, computers and software are used to evaluate many design iterations, to assess functional and dimensional requirements, to evolve designs for a better balance of requirements, to evaluate the sources of variation, and to optimize cost scenarios. All these efforts begin prior to ordering the first piece of hardware. Hardware, such as components, sub-systems, and prototype vehicles, is now used to confirm that our designs are great, rather than being used to find where our designs need improvement. Undoubtedly, the first in the automotive industry to successfully implement this strategy will create a significant advantage over the competition.

John Givens will share details about the strategy at GM Powertrain that is transforming the Process of Engineering from a dependence on physical evaluations to a reliance on Engineering design and analysis, based on physical principles backed by physical confirmation. He will show how adopting the RLM strategy leads to higher quality design, reduces structural cost, cuts the reliance on physical test, and improves product development time.

ABOUT JOHN GIVENS

John L. Givens, Jr., is the Director of Engineering Math & Release Processes (EM&RP) at GM Powertrain. The EM&RP organization has the responsibility to improve and integrate GM Powertrain's Computer-Aided environment.

Prior to his current position John Givens was Director of the Synthesis & Analysis department, a CAE-focused organization within GM Powertrain Engineering targeting product quality. John's efforts in developing and implementing CAE standard work contributed to major cost reductions globally, and led to the acceptance of proactive CAE usage at GM Powertrain. He was also the first GM Powertrain Director of Electronic Controls Software Engineering. John has led this group to take advantage of reduced-cost electronic controllers via usage of common software across multiple controller suppliers.

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